SURVEY SCOPE OF SERVICES

The Scope of Work shall include all necessary professional engineering, surveying, and Aviation planning and project management services related to the completion of the required aeronautical surveys for supporting the development of LPV Approaches. The Advisory Circulars (AC) identified below, detail the data collection requirements and accuracies for the project and verification by the National Geodetic Survey (NGS).

- AC 150/5300-16A "General Guidance and Specifications for Aeronautical Surveys: Establishment of Geodetic Control and Submission to the National Geodetic Survey."

- AC 150/5300-17B "General Guidance and Specifications for Aeronautical Survey Airport Imagery Acquisition and Submission to the National Geodetic Survey."

- AC 150/5300-18B "General Guidance and Specifications for Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards."

- Supplemental Instructions specific to any surveyed airport, identifying any additional survey requirements of the airport Sponsor such as departure operations or other planning or airport design requirements.

Data collected to the tolerances specified in the above Advisory Circulars are, but not limited to:

- collection and geo-referencing of aerial imagery covering the entire survey area,

- collection of all the runway end positions at the airport including orthometric and ellipsoid elevations/heights,

- collection of vertical profiles for the runway being considered for the instrument approach,

- collection of the position, elevation, and where required the appropriate navigational aid perpendicular point of all electronic and visual navigational aids (NAVAIDS) located on or associated with a current instrument approach servicing the airport,

- the position and elevation of obstructions determining according to the obstacle selection criteria outlined in AC 150/5300-18B,

- accurately positioned airport geodetic control determined according to the guidelines established in AC 150/5300-16A.

Specific services shall include but are not limited to:

1. Prior to commencement of fieldwork, the Consultant will submit Survey and Quality Control Plans to the Colorado Department of Transportation – Aeronautics Division (CDOT-Aeronautics) and the FAA Airport Surveying – GIS Program Manager via the FAA-GIS web site for review and approval. The Survey and Quality Control plan will include all items as required by FAA AC 150/5300-16A and FAA AC 150/5300-18B. No fieldwork will be performed prior to review and acceptance of the plan by the governing agencies. Special circumstances, which may impact the team's approach to completion of fieldwork, must also be taken into account.

2. The Consultant shall tie the airport survey to the National Spatial Reference System (NSRS) through a temporary connection processed through the NGS Online User Positioning System as outlined in AC 150/5300-16A.

3. In support of the data collection efforts and government photogrammetric analysis and acceptability determination, the Consultant shall acquire and submit the required deliverables as specified in AC 150/5300-17B "General Guidance and Specifications for Aeronautical Survey Airport Imagery Acquisition and Submission to the National Geodetic Survey." The Consultant will ensure they collect digital stereo aerial imagery covering the entire area of analysis including required sidelap and overlap. The imagery will be used by the NGS for government verification ensuring the survey data adheres to the quality requirements set forth by FAA AC 150/5300-18B. Submission of field data will not occur without NGS ASP acceptance of aerial imagery.

4. The Consultant shall conduct an obstruction analysis for runway(s) using the standards established for Airport Obstruction Chart surveys in AC 150/5300-18B, "General Guidance and Specifications for Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System Standards." The Consultant will use a Precision Instrument Runway (PIR) modified to 20,000 feet approach surface along with all the associated Part 77 Surfaces, i.e. Primary Surface, Approach Surface, Transitional surface(s), Horizontal, and Conical surfaces to complete the analysis.

5. The Consultant shall establish three permanent survey marks (unless already established), one Primary Airport Control Station (PACS) and two Secondary Airport Control Station (SACS) in accordance with AC 150/5300-16A "General Guidance and Specifications for Aeronautical Surveys: Establishment of Geodetic Control and Submission to the National Geodetic Survey."

6. The Consultant shall submit all data collected in the format specified in the Advisory Circulars to the CDOT-Aeronautics Division who will ensure the data is submitted to the FAA Airport Surveying-GIS Program. The Airport Surveying-GIS program provides access to the system solely to the airport Sponsor. However, the Sponsor may provide their access credentials to a Consultant on a temporary project specific basis, with responsibility for the accuracy and completeness of the data remaining the responsibility of the airport Sponsor. All data submissions to the FAA will be through the program's web site at http://airports-gis.faa.gov. The web site also provides guidance on the proper preparation of data for NGS for validation. Aerial photography or imagery will be submitted directly to NGS at the address listed in AC 150/5300-17B on an appropriately labeled recordable media such as CD, DVD, portable hard

drive etc., with the label identifying the airport and company contact information. In order to provide the most current imagery for analysis, it should be collected within 6 months of the start of field survey operations.

7. The Consultant shall submit periodic project status reports to the CDOT Aeronautics Division. The reports shall contain progress updates and any significant issues with the project including deviations from the planned schedule.

At the conclusion of this contract all data collected will be turned over to the Airport sponsor/proponent. This task shall be completed within a time frame to be negotiated from Notice-To-Proceed.

SPECIFIC PROJECT REQUIREMENTS

Prior to commencing work the Consultant shall provide to the CDOT Aeronautics Division the following:

1. Identify the Project Manager who shall be a registered licensed surveyor in the State of Colorado.

2. Written Summary of:
    a. Experience in Global Positioning System (GPS) survey projects.
    b. Experience with NGS specifications, standards, and software. Give examples of using required data submission formats and required survey accuracies, etc.
    c. Knowledge of the NSRS, NGS Continuously Operating Reference Stations (CORS), horizontal and vertical controls, and the High Accuracy Reference Network (HARN).
    d. Experience using CORS data to establish geodetic ties to NSRS.
    e. Experience in establishing aerial photography, ground control points, reading and annotating information on aerial photography.
    f. Experience in recovering marks, setting marks, and writing station descriptions of survey marks to NGS standards.

3. Description of the methodology for surveying/consulting services to be provided in the Scope of Work (identify action items, timeliness, necessary Airport resources and information).

4. Document(s) detailing how the Consultant will manage, track, and oversee the project execution from start to finish. The Consultant will identify any project management software/tools they expect to use.

5. If not already accomplished under the Consultant's Agreement, insurance of the types and in the amounts considered reasonable and within normal customs or required by law shall be purchased and maintained by the Consultant and any of its sub-contractors during the life of the project and for the period following completion thereof.

6. A project schedule identifying the milestones through the life of the project.

SUPPLEMENTAL WORK

At any time during the period of the project, CDOT-Aeronautics may request that the Consultant expand the services identified in the scope of work to include additional aeronautical surveys for other airports. If these services become needed, CDOT-Aeronautics would request the Consultant provide an amended Scope of Work and cost proposal to be prepared at that time.